EPIDEMIOLOGY AND CONTROL OF VASCULAR-STREAK DIEBACK OF COCOA IN PAPUA NEW GUINEA.

Submitted by

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SUMMARY

Isolates of *Oncobasidium theobromae* , the cause of vascular-streak dieback of cocoa, were grown in culture. A new double layer culturing technique has been developed that supports rapid, consistent growth of the fungus. Although monilioid hyphae were abundant on double layer plates with a base layer of 1.5% water agar and a top liquid layer of modified malt extract medium, basidiospores were not formed in culture. Differences in results for growth and sporulation between Papua New Guinea and Malaysia indicate that the two countries may have different strains of the fungus.

Spore release in the field was highly correlated with the number of consecutive hours of sporophore wetness. If sporophores were wet for 5 hours or less, no spores were released. Sporulation increased progressively as the period of sporophore wetness increased from 5 hours, reaching a maximum at 12 hours. Spore release was highly correlated with the number of rainy days, but the number of spores released showed no correlation with rainfall volume. Dew deposition induced sporulation in the absence of rain, providing the sporophores were exposed to the open sky which resulted in very heavy dew deposition. However, only small numbers of spores were released and their development was limited. Laboratory studies using field-collected sporophores revealed that sporulation required an alternating light and dark cycle, and that spores were released only during the dark period. If during the dark period the temperature exceeded 26ºC, or the relative humidity fell below 95%, or if the sporophore was not initially wetted, no spores were released.

It was evident that *O. theobromae* penetrates cocoa flush leaves directly through the cuticle. It appears that flush leaves between 2.5 and 8.0 cm

may be more susceptible to penetration than leaves outside this range. The relative daily growth rate of the leaves is at its greatest between 2.5 and 8.0 cm and this may result in a weaker cuticle during this period which would facilitate penetration.

In the search for other hosts of the fungus, the presence of vascular-streak dieback in avocados was confirmed. Avocados tolerant to infection were discovered, and this provides evidence that *O. theobromae* may have a similar, virtually endophytic, association with the hypothetical indigenous host.

Plantation management strategies can greatly influence the spread and severity of the disease. Light shade was shown to reduce the number and size of sporophores of *O. theobromae* formed on infected cocoa. Low planting densities increase the tolerance of cocoa to vascular-streak dieback by improving tree vigour. Pruning out of all infections is only recommended when the level of infection is low. Pruning rounds should be started at the end of the wet season, and pruning during the wet season should be avoided. As well as removing inoculum, pruning encourages new growth which improves tolerance.

Eleven new components of resistance to the disease, not previously studied, were identified and used to rank resistance of 25 genotypes from a new crossing program. A far more accurate assessment of resistance is possible using these components of resistance compared with the previous ranking method which used only one. The method can be used to screen seedling material as well as mature trees. A method of measuring tolerance to infection was developed and used in the ranking of the genotypes.